

<b>f</b>	<b>Fermi National Accelerator Laboratory Batavia, IL 60510</b>	
<b>CMS ME3/1 ANODE PANEL FR-4 BAR GLUING TRAVELER</b>		
<b>Reference Drawing(s)</b> <b>Endcap Muon Chamber ME3/1 Final Assembly 5520-ME-368310</b>  <b>Endcap Muon Chamber Anode Panel Assembly 5520-ME-368311</b>		
<b>Budget Code:</b>	<b>Project Code:</b>	
<b>Released by:</b>	<b>Date:</b>	
<b>Prepared by:</b> M. Hubbard, B. Jensen, L. Lee		
<b>Title</b>	<b>Signature</b>	<b>Date</b>
<b>TD / E&amp;F Process Engineering</b>	Bob Jensen/Designee	
<b>TD / E&amp;F CMS Assembly</b>	Glenn Smith/Designee	
<b>TD / E&amp;F Technological Physicists</b>	Oleg Prokofiev/Designee	
<b>TD / CMS Project Manager</b>	Giorgio Apollinari/Designee	

Revision Page

Revision	Step No.	Revision Description	TRR No.	Date
None	N/A	Initial Release	N/A	04/26/00

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**Ensure appropriate memos and specific instructions are placed with the traveler before issuing the sub traveler binder to production.**

1.0 General Notes

- 1.1 White (Lint Free) Gloves (Fermi stock 2250-1800) or Nitrile Gloves (Fermi stock 2250-2040) shall be worn by all personnel when handling all product parts after the parts have been prepared/cleaned.
- 1.2 All steps that require a sign-off shall include the Technician/Inspectors first initial and full last name.
- 1.3 No erasures or white out will be permitted to any documentation. All incorrectly entered data shall be corrected by placing a single line through the error, initial and date the error before adding the correct data.
- 1.4 All Discrepancy Reports issued shall be recorded in the left margin next to the applicable step.
- 1.5 All personnel performing steps in this traveler must have documented training for this traveler and associated operating procedures.
- 1.6 Personnel shall perform all tasks in accordance with current applicable ES&H guidelines and those specified within the step.
- 1.7 Cover the panel/chamber with Mylar when not being serviced or assembled.
- 1.8 Never hand pass anything over a panel as dropped items may damage the panel.

2.0 Parts Kit List

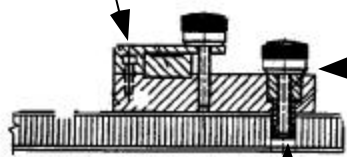
- 2.1 Attach the completed Parts Kit List for the CMS Anode Panel Gluing to this traveler. Ensure that the serial number on the Parts Kit List matches the serial number of this traveler. Verify that the Parts Kit received is complete.

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Process Engineering/Designee

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Date

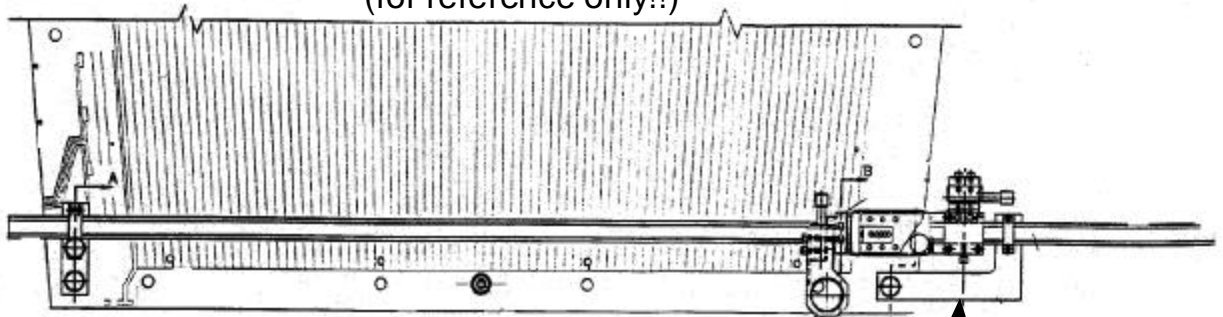
3.0 Panel Preparation (Side #2)Completed ☐

- 3.1 Acquire the Anode Panel (ME-368311) as per the Panel Serial Number at the bottom of this traveler. ☐
- 3.2 Clean the entire panel with Ethyl Alcohol (Fermi Stk. No. #1920-0600) and a low lint wipe (Fermi Stk No. 1660-2500) to remove any dirt, dusts, oils, and other foreign material on the panel ☐
- 3.3 Install the Mark Position Measuring Device Assembly (MD-368990) onto the panel. When installing the Mark Positioning Tooling, ensure the expanding bushing is fully relaxed before installing into the panel. Also, ensure the aluminum spool is fully inserted into the tooling before tightening the rubber bushing. ☐

Side View of  
Installed Mark  
Positioning Tooling

Ensure aluminum spool is fully inserted into the tooling before tightening the rubber bushing.

Ensure expanding rubber bushing is fully relaxed prior to insertion into panel

Top View (panel narrow view)  
(for reference only!!)CMS Mark Tooling Assy  
(MD-368990)

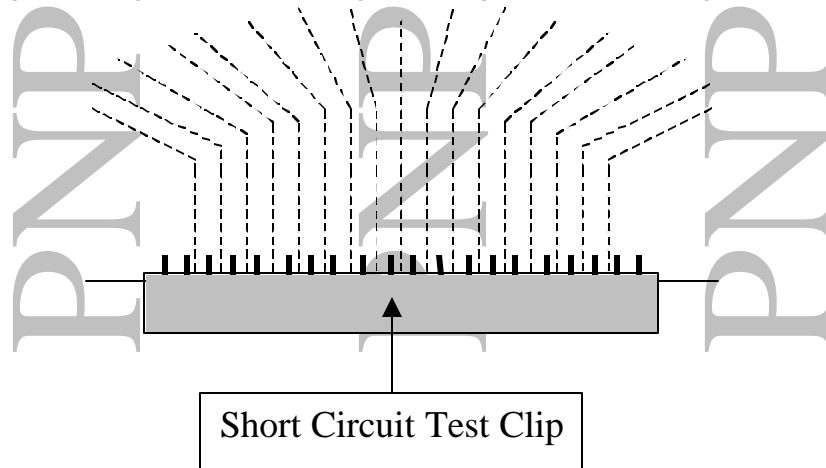
- 3.4 Measure the panel and record the measurements on Measurement Form 5520-FM-333476 and attach the completed form to this traveler. ☐

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Technician(s)\_\_\_\_\_  
Date

- 3.5 Using two Short Circuit Tester Units, check all five strip connector circuits. Starting from the left of the serial number, place a Short Circuit Tester on Circuits #1 and #2.

**Note(s):**

Ensure there are two prongs on each side of the outer strips as shown in the diagram.



- 3.5.1 If no RED or GREEN lights activate, then continue checking the balance of the circuits as per below chart.

Circuit	Pass	Fail
+ Circuit #1		
+ Circuit #2		
+ Circuit #2		
+ Circuit #3		
+ Circuit #3		
+ Circuit #4		
+ Circuit #4		
+ Circuit #5		

**Note(s):**

After measurements are completed inform supervisor of any failures.  
If all pass continue.

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Technician(s)

\_\_\_\_\_  
Date

Completed

3.6 Transport the Anode panel to the Wire Fixation Bar Installation station.

3.7 Acquire the following Anode panel FR-4 parts and clean with Ethyl Alcohol (Fermi Stk. No. #1920-060000) and Texwipe TX325 (3" X 2.5") Natural Wipes (McMaster-Carr) to remove any dirt, dusts, oils, and other foreign material.

2 ea	MB-368468	Wire Fixation Bar, 3/1 L-1
2 ea	MB-368472	Wire Fixation Bar, 3/1 L-2
2 ea	MB-368476	Wire Fixation Bar, 3/1 L-3
2 ea	MB-368470	Wire Fixation Bar, 3/1 R-1
2 ea	MB-368474	Wire Fixation Bar, 3/1 R-2
2 ea	MB-368478	Wire Fixation Bar, 3/1 R-3
4 ea	MA-368305	Gas Sleeve
18 ea	MA-368250	Pins (Wire Fixation Bars)

3.8 Clean the Protection Strip Set Assy's (MD-368576) for both sides with Ethyl Alcohol (Fermi Stk No. 1920-0600) and a low-lint wipe (Ferm Stk No. 1660-2500).

3.9 Mix glue (Epoxy Adhesive #2216 Parts A&B) in a 50/50 ratio using approximately 40 grams of each. Allow the glue to sit for at least 30 minutes and no more than 45 minutes.

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Technician(s)

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Date

Completed

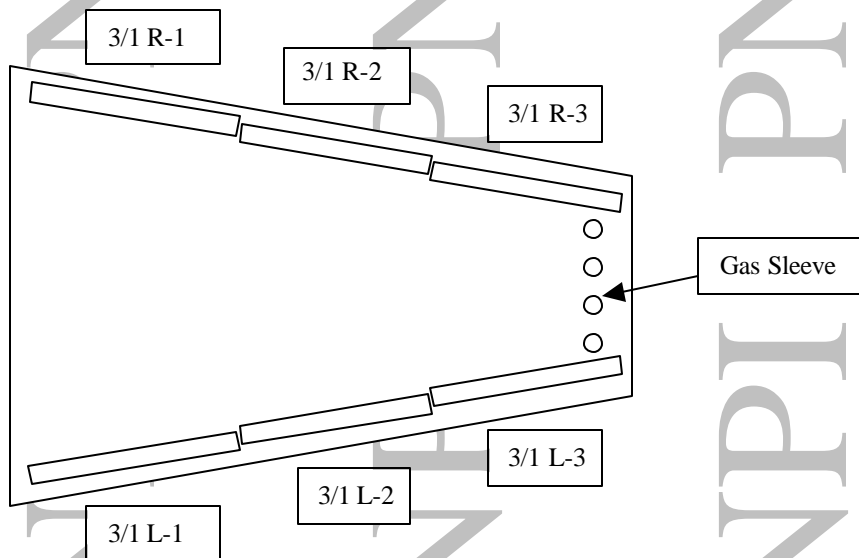
3.10 Install the Fixation Pins (MA-368250 [18 ea]) into panel.



3.11 Install the Wire Fixation Bars 3/1 L-1, 3/1 L-2, 3/1 L-3, 3/1 R-1, 3/1 R-2 and 3/1 R-3 onto the Wire Fixation Pins in the panel in accordance with drawing Figure 1.

**Note(s):**

**When installing the Wire Fixation Bars, visually inspect the location by verifying placement of Wire Fixation Bar end angles and Wire Fixation Bar solder pads.**

*Figure 1*

3.12 Place Post-it Tape (Fermi Stk No. 1330-1310 (Red) or equivalent) Flags over each of the Fixation pin holes.



3.13 Install the Protection Strip Set Assy's onto the Wire Fixation Bars and secure to the panel. Ensure the Protection Strip Set Assy is mounted flush to the panel.




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 Technician(s)

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 Date

4.0 Panel Preparation (Side #1)

Completed

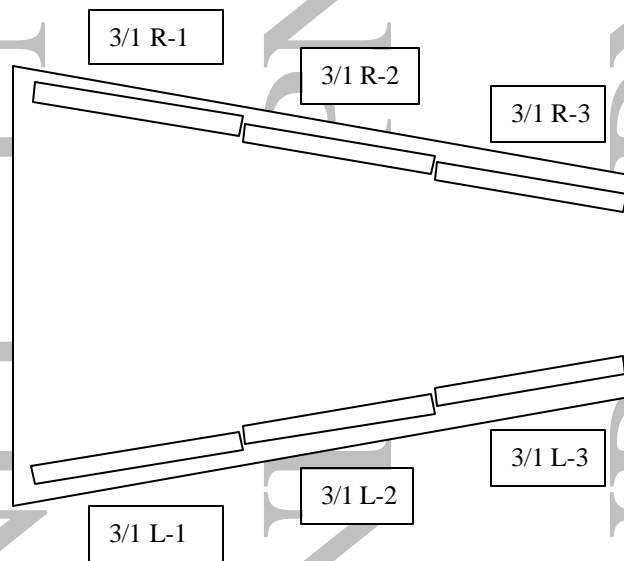
4.1 Rotate the Anode Panel 180°.



4.2 Install the Wire Fixation Bars 3/1 L-1, 3/1 L-2, 3/1 L-3, 3/1 R-1, 3/1 R-2 and 3/1 R-3, onto the Fixation Pins in the panel in accordance with drawing Figure 1.

**Note(s):**

**When installing the Wire Fixation Bars, visually inspect the location by verifying placement of Wire Fixation Bar end angles and Wire Fixation Bar solder pads.**

*Figure 1*

4.3 Place Post-it Tape (Fermi Stk No. 1330-1310 (Red) or equivalent) Flags over each of the Fixation pin holes.

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Technician(s)\_\_\_\_\_  
Date



5.0 Panel Gluing (Side #1)

Completed

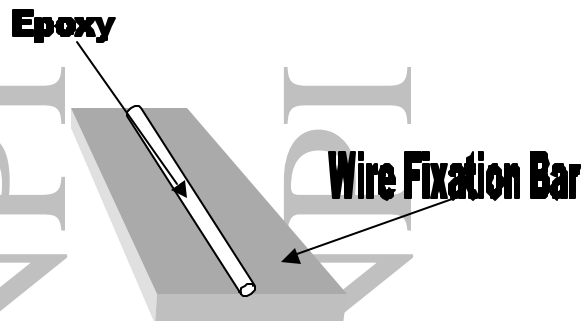
- 5.1 Remove the Wire Fixation Bars from the panel and transport them to the linear Gluing Machine (368882). ☐

**Note(s):****Ensure the holding brackets are clean before using.**

- 5.2 Place the Bars face down onto the holding brackets, keeping the 3/1 L-1, 3/1 L-2, and 3/1 L-3 on one bracket and the 3/1 R-1, 3/1 R-2 and 3/1 R-3 on the other. ☐
- 5.3 Perform test to define speed of linear Gluing Machine just prior to applying glue. ☐
- 5.3.1 Prepare and weigh an empty cup. ☐
- 5.3.2 Set Pressure to 40 psi and Vacuum to 1psi. ☐
- 5.3.3 Turn the Machine to automatic mode and dispense epoxy into the cup for 30 seconds. ☐
- 5.3.4 Weigh the cup with the epoxy in it and subtract the weight of the empty cup to determine the weight of the epoxy. ☐
- 5.3.5 Using the average depth of the grooves beneath the Wire Fixation Bars and the weight of the glue, find the proper speed on the Charts located in the Gluing ES (ESXXXXXX). ☐
- 5.4 Place tape over the outer ends of the bars to prevent glue from getting on the edge. ☐

**Note(s):****The glue from the Linear Gluing Machine must be dispensed down the middle of the Wire Fixation Bars.**

- 5.5 According to the Operating Procedure, run the Linear Gluing Machine, dispensing glue down the middle of one set of bars, move the head over to the other side, reverse its direction of travel and dispense glue down the middle of the other set of bars ☐



- 5.6 Transport the bars with the glue applied to the gluing table. ☐

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Technician(s)\_\_\_\_\_  
Date

**Note(s):**

**Ensure those areas, which require the absence of glue be covered during the glue applying segment.**

- 5.7 Install the Wire Fixation Bars onto the Anode Panel. ☐

**Note(s):**

**Ensure correct placement of the Fixation Bars**

- 5.8 Place Post-it Tape (Fermi Stk No. 1330-1310 (Red) or equivalent) Flags over all the seams. ☐

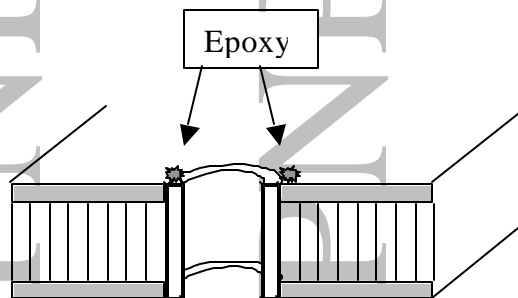
- 5.9 Install the Gas Sleeves into the narrow end of the panel. ☐

- 5.10 Apply a small amount of epoxy to the outer edge of the gas sleeves to seal the gap between the sleeve and panel hole. ☐

**Note(s):**

**Ensure that the gas sleeve through hole remains free of epoxy during this procedure**

**Ensure the gas sleeves are settled properly within the gas sleeve holes before applying the epoxy.**



- 5.11 Install the Protection Strip Set Assy's (MD-368576) to the topside of the panel and secure to the panel. Ensure the Protection Strip Set Assy is mounted flush to the panel ☐

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Technician(s)

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Date

Completed

- 5.12 Transport the Anode Panel to the Clamp Table Assy (MD-368786) and install onto to the Clamp Table Assy. ☐

- 5.13 Clamp on top of the Wire Fixation Bars with clamp bars, then pressurize the clamp bar to 5 PSI for 16 hours minimum. Check to be sure that the clamping bar is in alignment with the Fixation Bar before pressurizing. Record date/time the panel was placed under pressure in the box below. ☐

	Date	Time	Pressure
Start			
Finish			

- 5.14 After 16 hours minimum, release the pressure on clamp bar. ☐

- 5.15 Take the Strip Set Assy off and remove the Tape Flags from over the pins. Reinstall the Strip Set Assy onto the panel. ☐

- 5.16 Remove excess Epoxy off the Wire Fixation Bars if any seeped out on the edges or through the pin holes. ☐

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Technician(s)

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Date

6.0 Panel Gluing (Side #2)

Completed

6.1 Remove panel from clamping table, rotate it 180° so side #2 is facing up and install back on the gluing table ☐

6.2 Remove the Protection Strip Set Assy (MD-368576) from the topside of the panel. ☐

6.3 Remove the Wire Fixation Bars from the panel and transport them to the linear Gluing Machine (368882). ☐

**Note(s):**

**Ensure the holding brackets are clean before using.**

6.4 Place the Bars face down onto the holding brackets, keeping the 3/1 L-1, 3/1 L-2, and 3/1 L-3 on one bracket and the 3/1 R-1, 3/1 R-2 and 3/1 R-3 on the other. ☐

6.5 Perform test to define speed of linear Gluing Machine just prior to applying glue. ☐

6.5.1 Prepare and weigh an empty cup. ☐

6.5.2 Set Pressure to 40 psi and Vacuum to 1psi. ☐

6.5.3 Turn the Machine to automatic mode and dispense epoxy into the cup for 30 seconds. ☐

6.5.4 Weigh the cup with the epoxy in it and subtract the weight of the empty cup to determine the weight of the epoxy. ☐

6.5.5 Using the average depth of the grooves beneath the Wire Fixation Bars and the weight of the glue, find the proper speed on the Charts located in the Gluing ES (ESXXXXXX). ☐

6.6 Place tape over the outer ends of the bars to prevent glue from getting on the edge. ☐

**Note(s):**

**The glue from the Linear Gluing Machine must be dispensed down the middle of the Wire Fixation Bars.**

6.7 According to the Operating Procedure, run the Linear Gluing Machine, dispensing glue down the middle of one set of bars, move the head over to the other side, reverse its direction of travel and dispense glue down the middle of the other set of bars ☐

6.8 Transport the bars with the glue applied to the gluing table. ☐

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Technician(s)

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Date

Completed

**Note(s):**

**Ensure those areas, which require the absence of glue be covered during the glue applying segment.**

- 6.9 Install the Wire Fixation Bars onto the Anode Panel. ☐

**Note(s):**

**Ensure correct placement of the Fixation Bars**

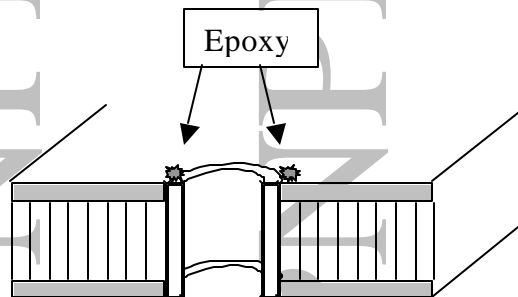
- 6.10 Place Post-it Tape (Fermi St No. # 1330-131000 (Red) or equivalent) Flags over all the seams. ☐

- 6.11 Apply a small amount of epoxy to the outer edge of the gas sleeves to seal the gap between the sleeve and panel hole. ☐

**Note(s):**

**Ensure that the gas sleeve through hole remains free of epoxy during this procedure**

**Ensure the gas sleeves are settled properly within the gas sleeve holes before applying the epoxy.**



- 6.12 Install the Protection Strip Set Assy's (MD-368576) to the topside of the panel and secure to the panel. Ensure the Protection Strip Set Assy is mounted flush to the panel ☐

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 Technician(s)

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 Date

Completed

- 6.13 Transport the Anode Panel to the Clamp Table Assy (MD-368786) and install onto the Clamp Table Assy. ☐

- 6.14 Clamp on top of the Wire Fixation Bars with clamp bars, then pressurize the clamp bar to 5 PSI for 16 hours minimum. Check to be sure that the clamping bar is in alignment with the Fixation Bar before pressurizing. Record date/time the panel was placed under pressure in the box below. ☐

	Date	Time	Pressure
Start			
Finish			

- 6.15 After 16 hours minimum, release the pressure on clamp bar. ☐

- 6.16 Take the Strip Set Assy off and remove the Tape Flags from over the pins. Reinstall the Strip Set Assy onto the panel. ☐

- 6.17 Remove excess Epoxy off the Wire Fixation Bars if any seeped out on the edges or through the pin holes. ☐

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Technician(s)

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Date

7.0      Fixation Bar Measurement (Side #2)

Completed

- 7.1

Remove panel from clamping table and transport to the Fixation Bar Measurement Station.

☐
- 7.2

Remove the Protection Strip Set Assy (MD-368576) from the topside of the panel.

☐
- 7.3

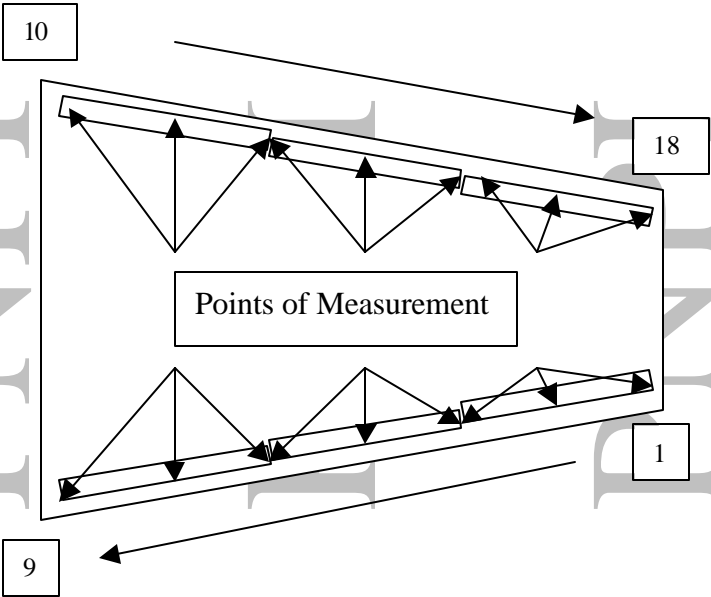
Inspect the Wire Fixation Bars to make sure there are no drops of epoxy on the soldering pads.

☐
- 7.4

Using a Depth Micrometer /Dial Indicator, measure the height of the fixation bar from the panel surface to the top of the bar. Start at narrow end left side continue down side, across wide, back to narrow. The measurements will be taken on outside of the wire fixation bar at 3 points (End, Middle and End) of the Wire Fixation Bars. The measurement must be within a range of 0.186” to 0.194”.

☐

**Note(s):**  
Measurements that are out of range need to be indicated in the table below in RED ink showing the actual measurement.



7.5 Indicate side being measured:

Strip ☐ Non-Strip ☐

#	Pass	Fail	#	Pass	Fail
1			10		
2			11		
3			12		
4			13		
5			14		
6			15		
7			16		
8			17		
9			18		

Note(s):

After measurements are completed inform supervisor of any failures.

If all pass continue.

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Technician(s)

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Date



8.0      Fixation Bar Measurement (Side #1)

Completed

- 8.1

Rotate the panel 180° so side #1 faces up.

☐
- 8.2

Remove the Protection Strip Set Assy's (MD-368576) from the topside of the panel.

☐
- 8.3

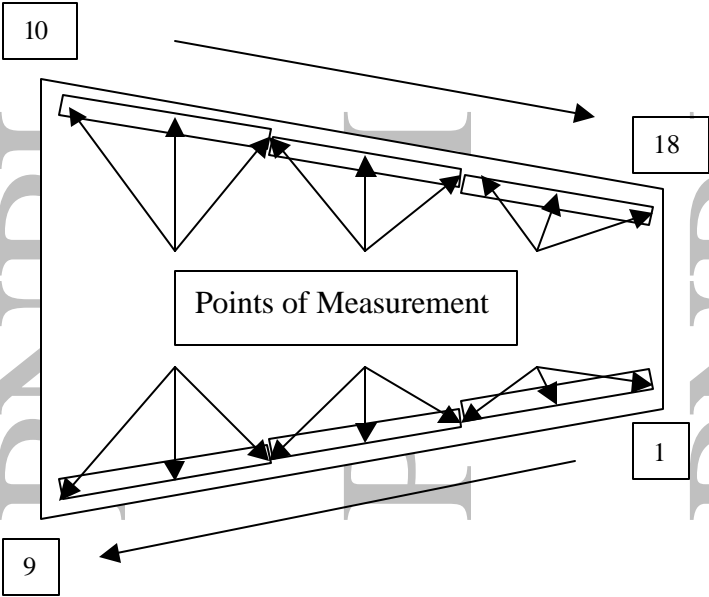
Inspect the Wire Fixation Bars to make sure there are no drops of epoxy on the soldering pads.

☐
- 8.4

Using a Depth Micrometer /Dial Indicator, measure the height of the fixation bar from the panel surface to the top of the fixation bar. Start at narrow end left side continue downside across wide, back to narrow. The measurements will be taken on outside of the wire fixation bar at 3 points (End, Middle and End) of the Wire Fixation Bars. The measurement must be within a range of 0.186" to 0.194".

☐

**Note(s):**  
Measurements that are out of range need to be indicated in the table below in RED ink showing the actual measurement.



8.5 Indicate side being measured:

Strip ☐Non-Strip ☐

#	Pass	Fail	#	Pass	Fail
1			10		
2			11		
3			12		
4			13		
5			14		
6			15		
7			16		
8			17		
9			18		

**Note(s):****After measurements are completed inform supervisor of any failures.****If all pass continue.**\_\_\_\_\_  
Technician(s)\_\_\_\_\_  
Date

8.6 Transport the Anode Panel to the Panel Staging Area.

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Technician(s)\_\_\_\_\_  
Date

9.0 Production Complete

- XXX** 9.1 Process Engineering verify that the Anode Panel Gluing Traveler (5520-TR-333456) is accurate and complete. This shall include a review of all steps to ensure that all operations have been completed and signed off. Ensure that all Discrepancy Reports, Nonconformance Reports, Repair/Rework Forms, Deviation Index and dispositions have been reviewed by the Responsible Authority for conformance before being approved.  
Comments:

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Process Engineering/Designee

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Date

- 10.0 Attach the Process Engineering "OK to Proceed" Tag on the panel.

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Process Engineering/Designee

\_\_\_\_\_  
Date

- 11.0 Proceed to the next major assembly operation as required.